CE EMC
TEST REPORT

For

DC-DC CONVERTER

Model : KQWS SERIES

Brand : DANUBE

Test Report Number:

91117403-E

Issued for

Danube Enterprise Co., Ltd.

A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814, Taiwan(R.O.C.)

Issued by

Compliance Certification Services Inc.

Tainan Laboratory

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.
TEL: 886-6-580-2201

FAX: 886-6-580-2202

Issued Date: February 25, 2010

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REVISION HISTORY

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		February 25, 2010		Initial Issue	ALL	Leah Peng

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1 TEST CERTIFICATION

Product:	DC-DC CONVERTER
Model:	KQWS SERIES
Brand:	DANUBE
Applicant:	Danube Enterprise Co., Ltd. A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814, Taiwan(R.O.C.)
Manufacturer:	Danube Enterprise Co., Ltd. A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814, Taiwan(R.O.C.)
Tested:	January 26, 2010 ~ February 11, 2010
Applicable Standards:	**EN 55022:2006** **EN 55024:1998+A1:2001+A2:2003** IEC 61000-4-2:1995+A1:1998+A2:2000 IEC 61000-4-3:2006 IEC 61000-4-4:2004 IEC 61000-4-5:2005 IEC 61000-4-6:2007 IEC 61000-4-8:1993+A1:2000

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Jeter Wu
Section Manager

Reviewed by:

Eric Huang
Assistant Section Manager

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2 TEST RESULT SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
EN 55022: 2006	Conducted (Main Port)	N/A	**No requirement for DC device**
	Radiated	PASS	Meet Class A limit
EN 61000-3-2 : 2006	Harmonic current emissions	N/A	**No requirement for DC device**
EN 61000-3-3 : 1995+A1: 2001+ A2: 2005	Voltage fluctuations & flicker	N/A	**No requirement for DC device**

IMMUNITY【 EN 55024:1998 + A1: 2001 + A2: 2003 】			
Standard	**Item**	**Result**	**Remarks**
IEC 61000-4-2: 1995+A1:1998+A2:2000	ESD	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-3: 2006	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 2004	EFT	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-5: 2005	Surge	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-6: 2007	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8: 1993 + A1: 2000	PFMF	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 2004	Voltage dips & voltage variations	N/A	No requirement for DC device

NOTE: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

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3 EUT DESCRIPTION

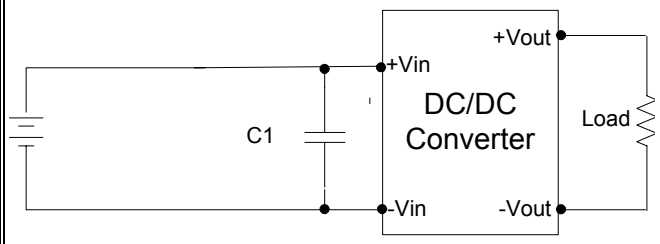
Product	DC-DC CONVERTER
Model	KQWS SERIES
Brand	DANUBE
Applicant	Danube Enterprise Co., Ltd.
Manufacturer	Danube Enterprise Co., Ltd.
Housing material	Metal
EUT Type	☒ Engineering Sample. ☐ Product Sample. ☐ Mass Product Sample.
Serial Number	N/A
Received Date	November 17, 2009
Power Source	For model: **KQWS-1205** (I/P:9-18VDC, O/P:5VDC / 8000mA) For model: **KQWS-1203.3** (I/P:9-18VDC, O/P:3.3VDC / 10000mA) For model: **KQWS-4815** (I/P:36-75VDC, O/P:15VDC / 2667mA)

NOTE:

1. Client consigns three model samples to test (Model Number: KQWS-1205; KQWS-1203.3; KQWS-4815). Therefore, the testing Lab. just guarantees the unit, which has been tested.

2. For more details, please refer to the User's manual of the EUT.

Typical applications for Surge test:



Capacitance Spec.	C1
Voltage	220uF, 100VDC

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KQWS PARTNUMBERS STRUCTURE

Series	Coding scheme	
KQWS Series	KQWv-x1x2THSzzz	KQ=Series Name W=Wide Input Range v=Type of output voltage (S=single output) x1=12V(9~18V ; 9~36V Input voltage) 24V(18~36V ; 18~75V Input voltage) 48V(36~75V Input voltage) x2=Output voltage(03.3~4.5V；05~8.5V； 09~11.5V；12~14.5V；15~18V) T= 4:1 Input voltage HS=With Heat Sink zzz= 0~9，A~Z or blank for market purpose.

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4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ mode is as the following:

EMI Test mode:

1. Full load (model: KQWS-1205)
2. Full load (model: KQWS-1203.3)
3. Full load (model: KQWS-4815)

EMS Test mode:

1. Full load (model: KQWS-1205)

4.2. EUT SYSTEM OPERATION

1. Setup whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test.

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5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

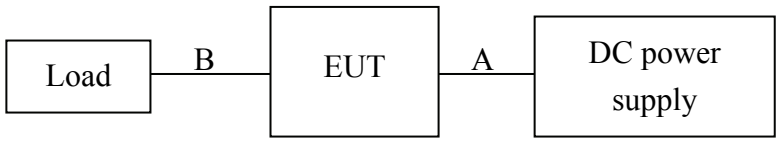
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	DC power supply	LOKO	DPS-5050	DOC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power Input cable	Unshielded, 0.7m, 1pcs.
B	DC Power Output cable	Unshielded, 0.01m, 1pcs.

NOTE:
1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST



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6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

CCS Tainan Lab.
No. 8, Jiu Cheng Ling, Jiaokeng Village,Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC
Japan	VCCI
Canada	INDUSTRY CANADA
Taiwan	TAF, BSMI
Europe	TÜV NORD

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsemc.com.tw

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6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Power Line Conducted Emission		9kHz~30MHz	±1.80dB
Radiated Emission (10m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.75dB
		200 MHz ~1000 MHz	±2.86dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.59dB
		200 MHz ~1000 MHz	±3.52dB
	Test Site : OATS-7	30 MHz ~200 MHz	±3.90dB
		200 MHz ~1000 MHz	±3.47dB
Radiated Emission (3m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.62dB
		200 MHz ~1000 MHz	±3.19dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.48dB
		200 MHz ~1000 MHz	±2.76dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:
(1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission room #1				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
L.I.S.N.	Rohde & Schwarz	ESH 3-Z5	840062/021	NOV. 29, 2010
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL. 16, 2010
BNC COAXIAL CABLE	CCS	BNC50	11	AUG. 26, 2010
Test S/W	e-3 (5.04211c) R&S (2.27)			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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7.1.3. TEST PROCEDURES

Procedure of Preliminary Test

- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 m is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.

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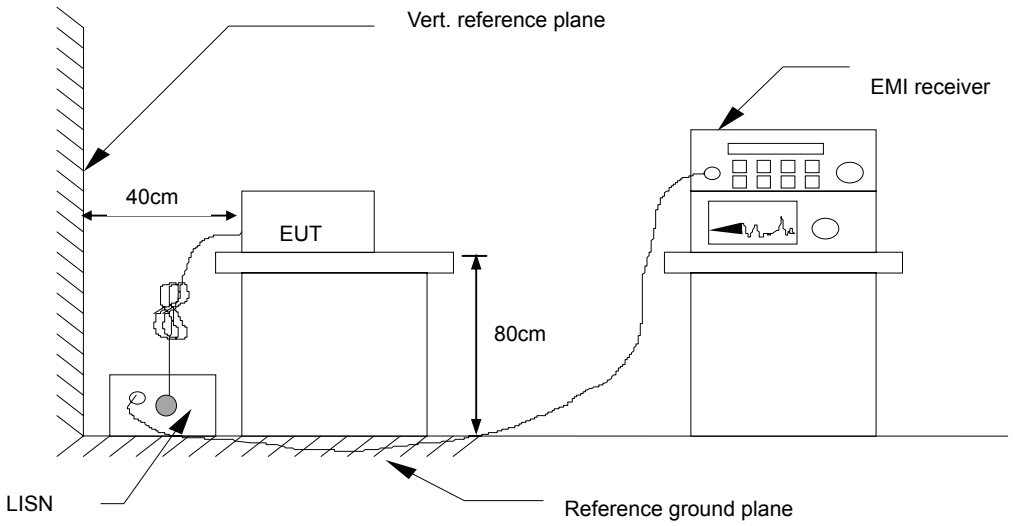
7.1.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector
x.xx	9.6	0.1	15.7	25.4	46	-20.6	QP

REMARKS： 1. Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)

2. Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

7.1.6. TEST RESULTS

NOTE: This EUT has not connection to AC Source directly. No applicability for this test.

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7.2. RADIATED EMISSION MEASUREMENT

7.2.1. LIMITS

FREQUENCY (MHz)	dBuV/m (At 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2.2. TEST INSTRUMENTS

Open Area Test Site # 7				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	Rohde & Schwarz	ESCS30	100343	DEC. 01, 2010
TYPE N COAXIAL CABLE	SUHNER	RG_214_U/2X	7	NOV. 26, 2010
BILOG ANTENNA	Sunol sciences	JB1	A013105-1	DEC. 10, 2010
Test Software	EMI e-3 / AUDIX (5.04211c)			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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7.2.3. TEST PROCEDURE

Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical usage as per EN 55022.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- Mains cables, telephone lines or other connections to auxiliary equipment located outside the test shall drape to the floor. No extension cords shall be used to mains receptacle.
- The antenna was placed at 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 m above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.

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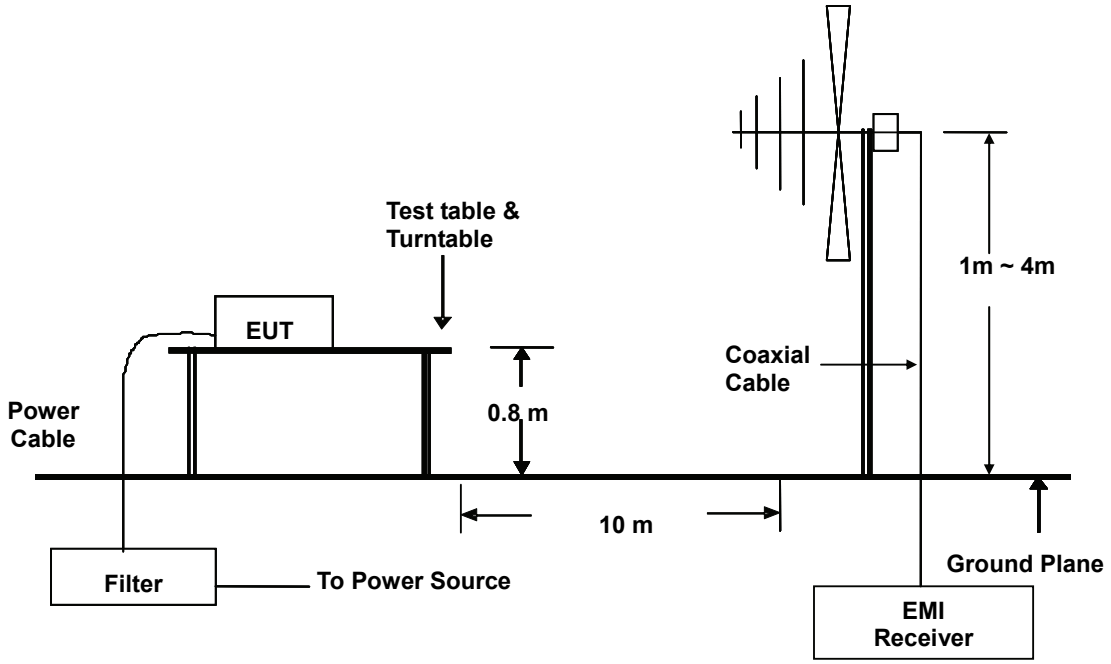
7.2.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.5. DATA SAMPLE

Freq. (MHz)	Reading Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dBuV/m)
xx.xx	14.00	12	0.2	26.2	30	-3.80

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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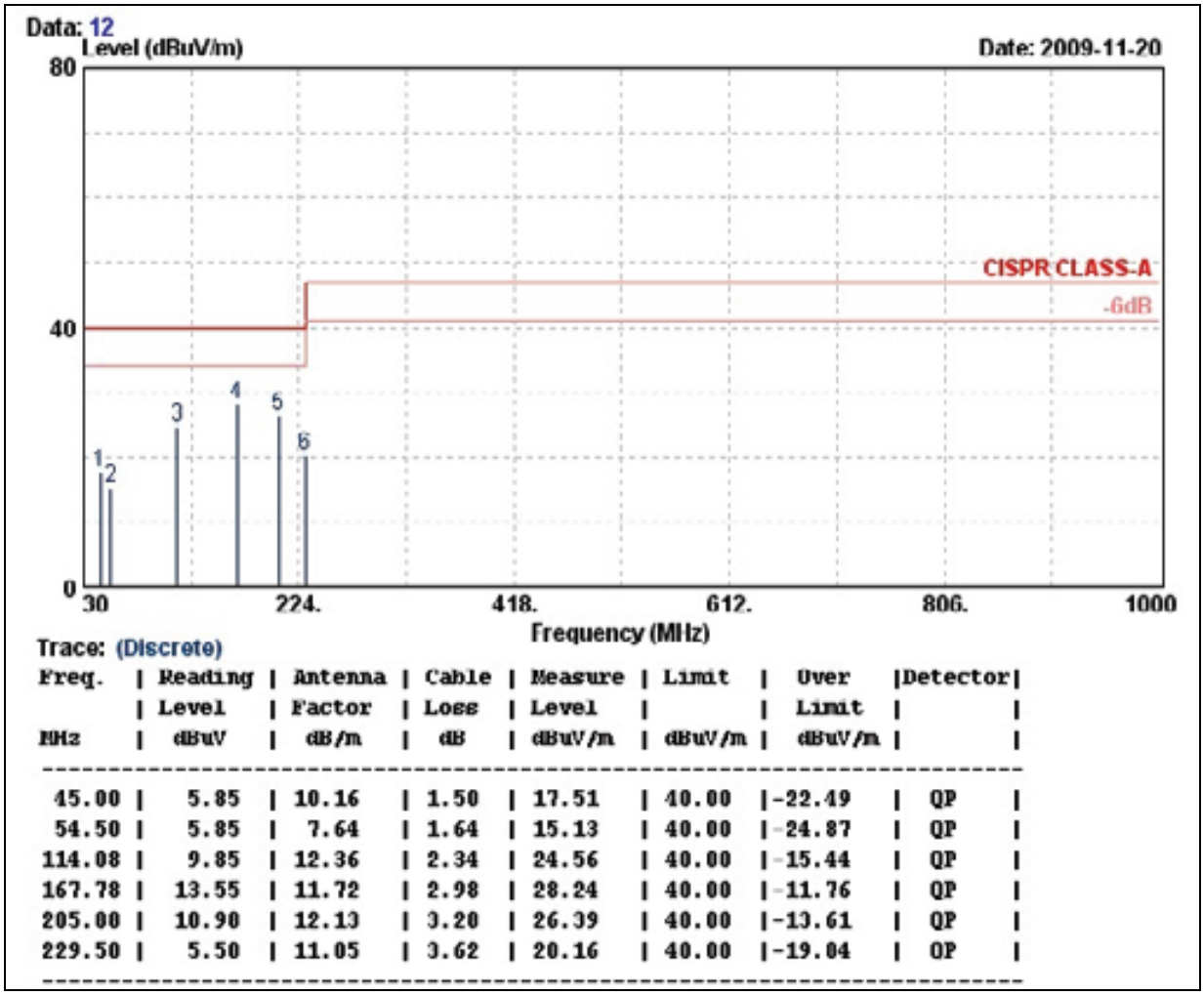
7.2.6. TEST RESULTS

Model No.	KQWS-1205	Test Mode	Full load
Environmental Conditions	31 ℃, 60 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
45.00	5.85	10.16	1.50	17.51	40.00	-22.49	QP
54.50	5.85	7.64	1.64	15.13	40.00	-24.87	QP
114.08	9.85	12.36	2.34	24.56	40.00	-15.44	QP
167.78	13.55	11.72	2.98	28.24	40.00	-11.76	QP
205.00	10.90	12.13	3.20	26.39	40.00	-13.61	QP
229.50	5.50	11.05	3.62	20.16	40.00	-19.84	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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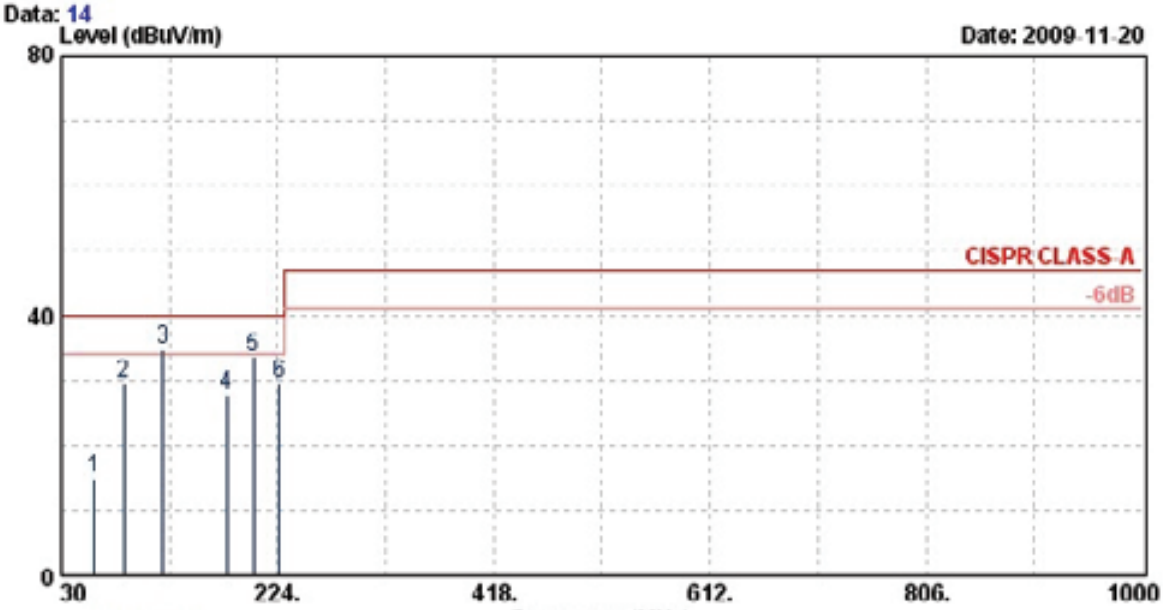
Model No.	KQWS-1205	Test Mode	Full load
Environmental Conditions	31 ℃, 60 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
59.50	5.85	7.28	1.69	14.82	40.00	-25.18	QP
86.30	19.78	7.78	1.96	29.52	40.00	-10.48	QP
120.03	10.09	13.42	2.42	34.73	40.00	-5.27	QP
178.63	13.58	11.08	3.08	27.74	40.00	-12.26	QP
202.45	18.12	12.43	3.24	33.79	40.00	-6.21	QP
225.65	15.21	10.88	3.56	29.66	40.00	-10.34	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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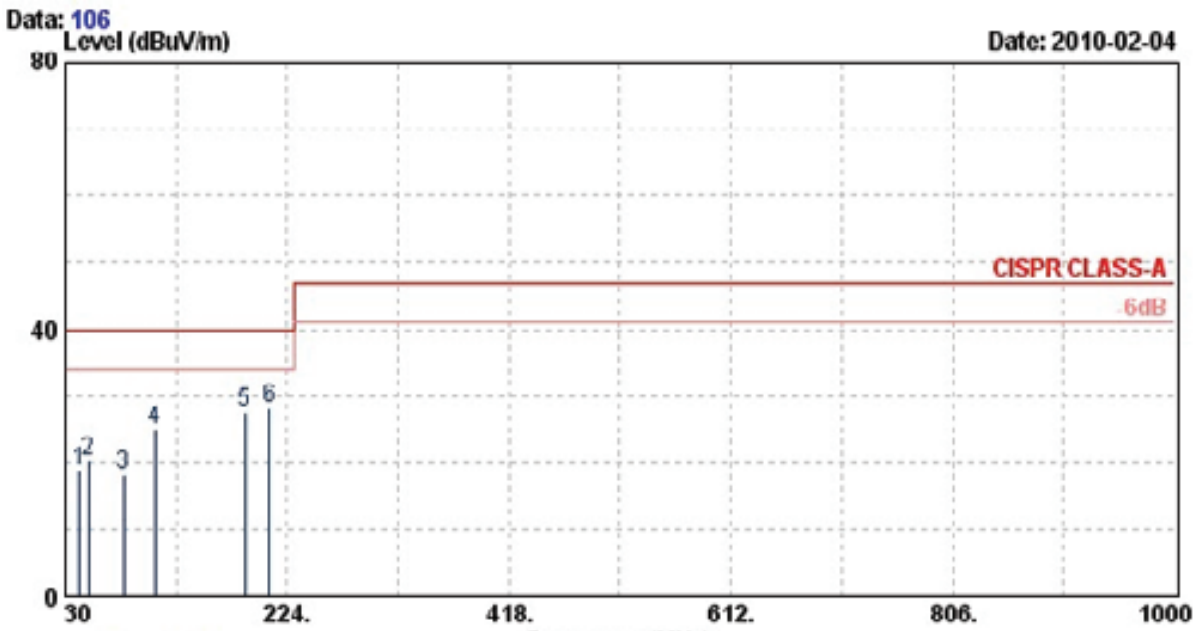
Model No.	KQWS-1203.3	Test Mode	Full load
Environmental Conditions	25.1 ℃, 54 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
42.15	6.45	11.20	1.16	10.09	40.00	-21.11	QP
50.50	10.05	0.30	1.20	20.35	40.00	-19.65	QP
80.54	8.55	7.80	1.90	18.25	40.00	-21.75	QP
108.65	10.87	11.83	2.23	24.93	40.00	-15.07	QP
186.54	12.74	11.61	3.22	27.57	40.00	-12.43	QP
208.45	11.85	12.61	3.55	28.01	40.00	-11.99	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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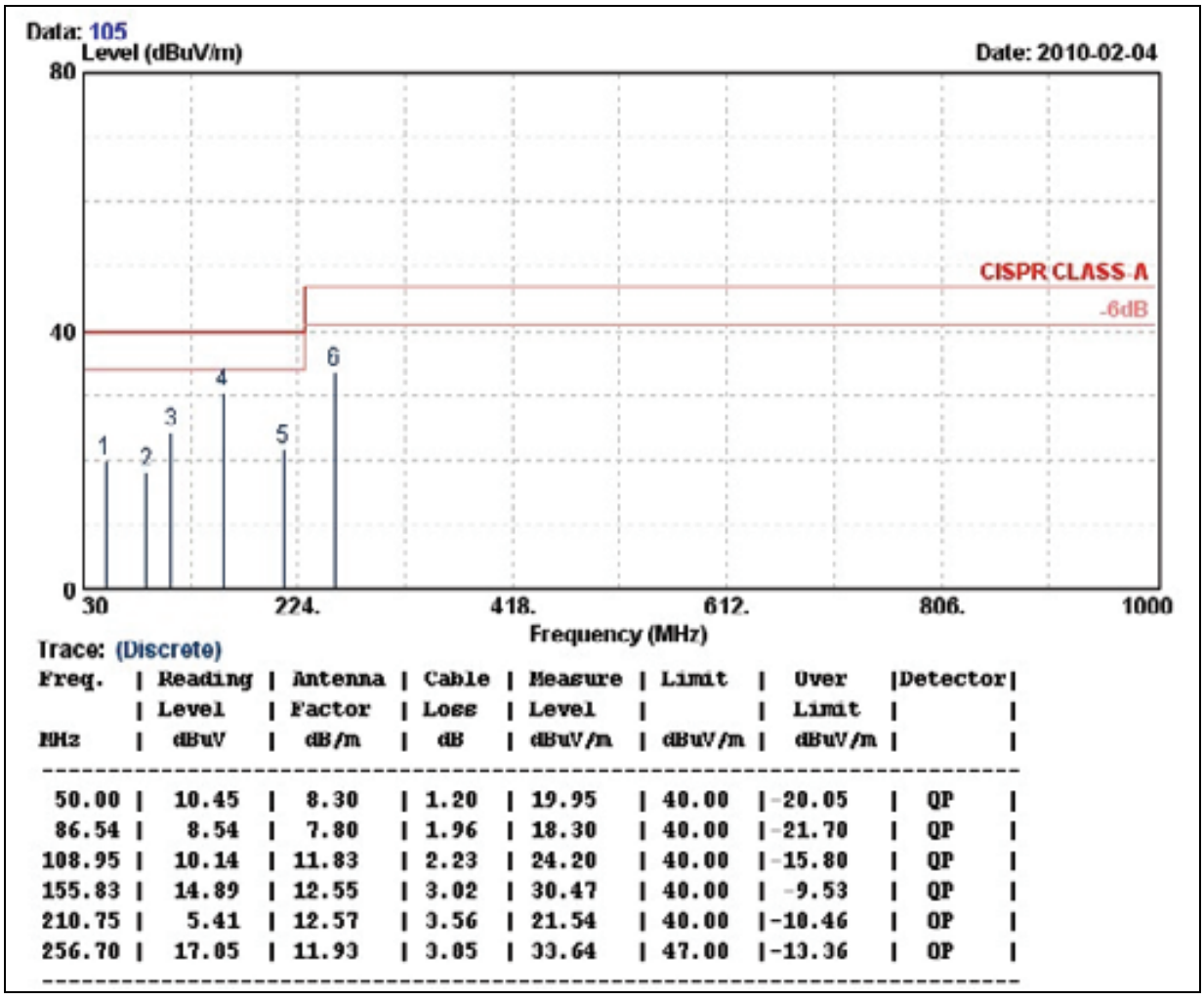
Model No.	KQWS-1203.3	Test Mode	Full load
Environmental Conditions	25.1 ℃, 54 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
50.00	10.45	8.30	1.20	19.95	40.00	-20.05	QP
86.54	8.54	7.80	1.96	18.30	40.00	-21.70	QP
108.95	10.14	11.83	2.23	24.20	40.00	-15.80	QP
155.83	14.89	12.55	3.02	30.47	40.00	-9.53	QP
210.75	5.41	12.57	3.56	21.54	40.00	-18.46	QP
256.70	17.05	11.93	3.05	33.64	47.00	-13.36	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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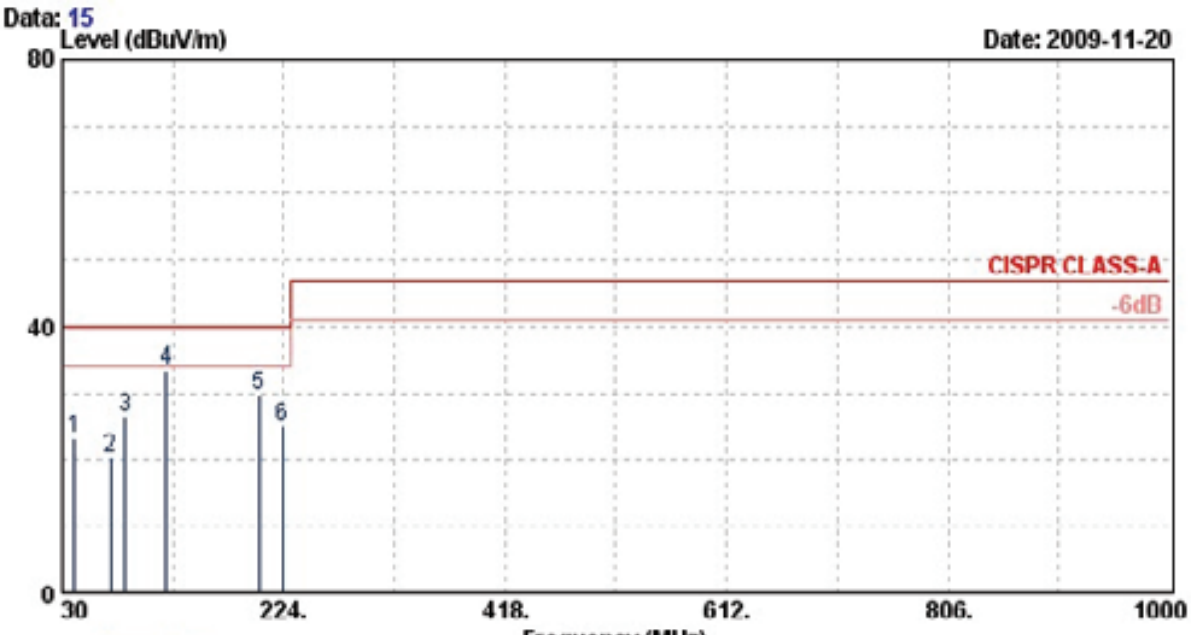
Model No.	KQWS-4815	Test Mode	Full load
Environmental Conditions	31 ℃, 60 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
40.98	9.12	12.73	1.34	23.19	40.00	-16.81	QP
72.08	10.58	7.72	1.82	20.12	40.00	-19.88	QP
85.18	16.54	7.75	1.95	26.24	40.00	-13.76	QP
120.80	17.54	13.42	2.42	33.38	40.00	-6.62	QP
202.15	13.90	12.53	3.23	29.74	40.00	-10.26	QP
222.90	10.54	10.76	3.52	24.02	40.00	-15.10	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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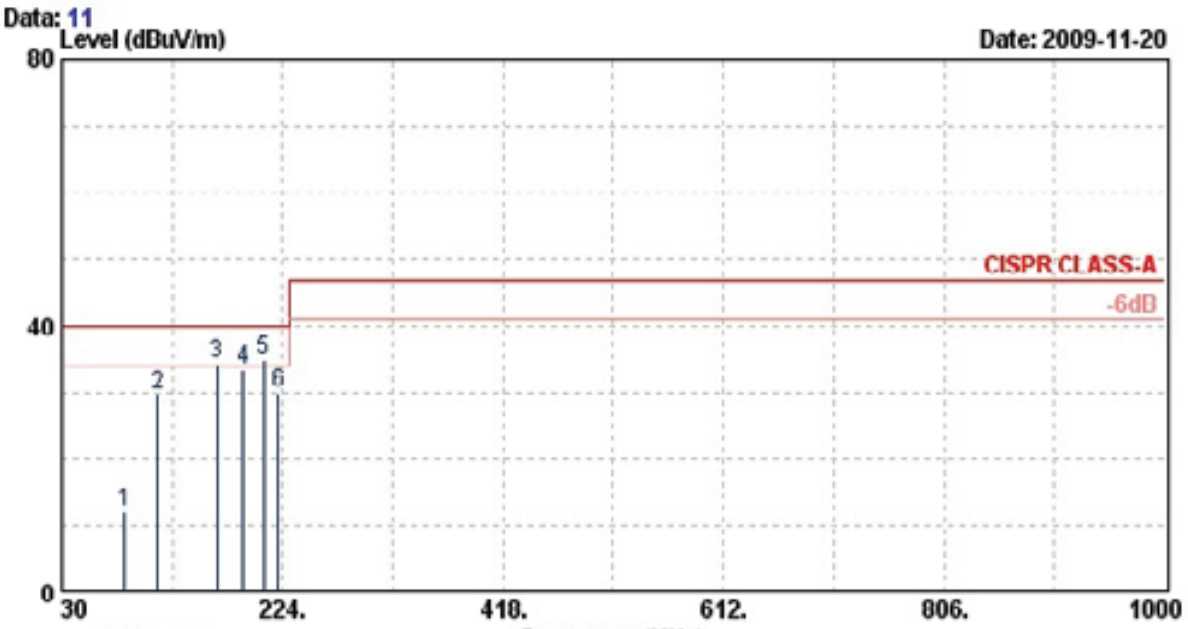
Model No.	KQWS-4815	Test Mode	Full load
Environmental Conditions	31 ℃, 60 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function:	Quasi-peak.	Tested By	Vision Chang



Trace: (Discrete)

Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
85.54	2.41	7.75	1.95	12.11	40.00	-27.89	QP
114.55	14.87	12.36	2.34	29.58	40.00	-10.42	QP
166.48	19.54	11.77	2.97	34.28	40.00	-5.72	QP
189.80	18.51	11.85	3.15	33.51	40.00	-6.49	QP
207.33	19.57	11.93	3.31	34.81	40.00	-5.19	QP
220.60	15.80	10.64	3.48	29.92	40.00	-10.08	QP

REMARKS： 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)

2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

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7.3. HARMONICS CURRENT MEASUREMENT

7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment	
Harmonics Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15<=n<=39	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8<=n<=40	0.23x8/n

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

NOTE: 1. Class A and Class D are classified according to item 7.3.3.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	DEC. 29, 2010
Test S/W	H/F HA 1600 PC LINK Field Probe			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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7.3.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- The classification of EUT is according to section 5 of EN 61000-3-2.
- The EUT is classified as follows:

  Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

  Class B: Portable tools; Arc welding equipment which is not professional equipment.

  Class C: Lighting equipment.

  Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

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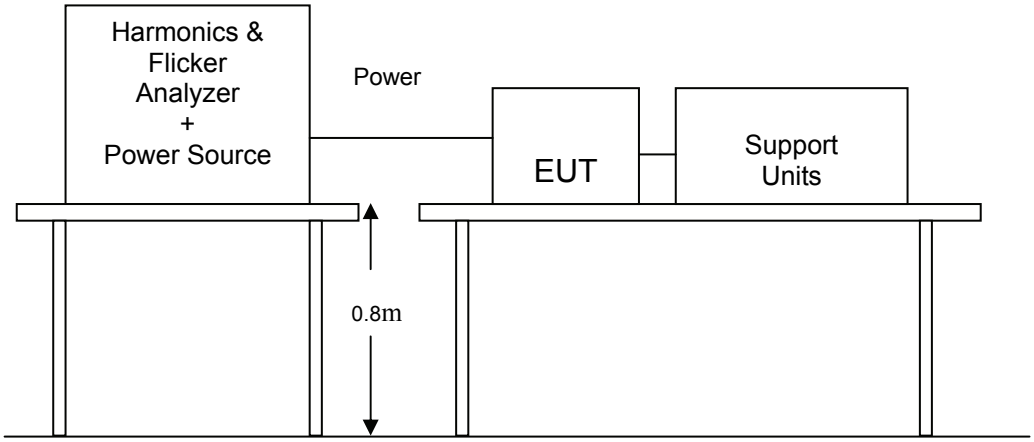
7.3.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.3.5. TEST RESULTS

※ For the equipment with a rated power of 75 W or less, limits are not specified in this standard.

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7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.4.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	DEC. 29, 2010
Test S/W	H/F HA 1600 PC LINK Field Probe			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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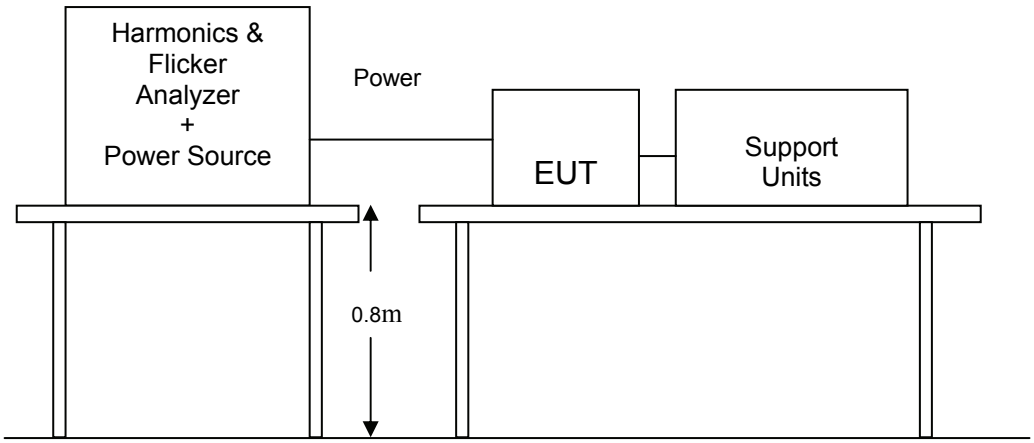
7.4.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 m above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4.5. TEST RESULTS

NOTE: This EUT has not connection to AC Source directly. No applicability for this test.

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8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 55024:1998 + A1: 2001 + A2: 2003	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge – ESD: 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 0.5kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, Power Port ~ Line to line: 0.5kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power frequency magnetic field immunity test 50/60Hz, 1A/m Performance Criterion A
	IEC 61000-4-11	This EUT has not connection to AC Source directly. No applicability for this test.

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8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Criteria A:	The apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria B:	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria C:	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

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8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Contact Discharge: 2 ; 4 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESD Simulator	NoiseKen	ESS-2002	ESS0523940	SEP. 30, 2010

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:
   The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 50 direct contact discharges. If there is no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b) Air discharges at slots and apertures and insulating surfaces:
   On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6 m x 0.8 m).
b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
c) The time interval between two successive single discharges was at least 1 second.
d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 m from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane (**VCP**) in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5 m x 0.5 m) was placed vertically to and 0.1 m from the EUT.

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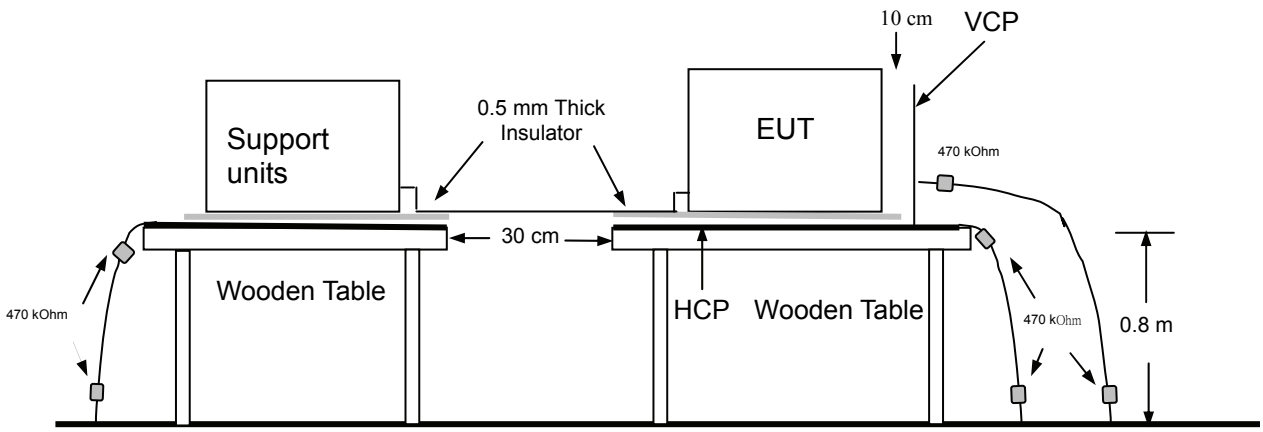
8.3.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 m high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25 mm thick, and 2.5 m square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6 m x 0.8 m) was placed on the table and attached to the **GRP** by means of a cable with 940kOhm total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5 mm thickness. A distance of 1meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1 m thickness. The GRP consisted of a sheet of aluminum that is at least 0.25 mm thick, and 2.5 m square connected to the protective grounding system and extended at least 0.5 m from the EUT on all sides.

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8.3.5. TEST RESULTS

Temperature	25 °C	**Humidity**	40 % RH
Pressure	1023 mbar	**Tested By**	Agun Huang
Required Passing Performance		**Criterion B**	

Air Discharge

Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3
Back	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3
Left	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3
Right	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3
Top	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3
Bottom	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3

Contact Discharge

Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☐A ☒B ☐C	Note ☐1 ☒2 ☐3
Back	☒	☒	☐	☒	☐	☐A ☒B ☐C	Note ☐1 ☒2 ☐3
Left	☒	☒	☐	☒	☐	☐A ☒B ☐C	Note ☐1 ☒2 ☐3
Right	☒	☒	☐	☒	☐	☐A ☒B ☐C	Note ☐1 ☒2 ☐3
Top	☒	☒	☐	☒	☐	☐A ☒B ☐C	Note ☐1 ☒2 ☐3
Bottom	☐	☐	☐	☐	☐	☐A ☐B ☐C	Note ☐1 ☐2 ☐3

Please refer to ESD test photo on next page for detail discharge point

Discharge To Horizontal Coupling Plane

Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Back	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Left	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Right	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3

Discharge To Vertical Coupling Plane

Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Back	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Left	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3
Right	☒	☒	☐	☒	☐	☒A ☐B ☐C	Note ☒1 ☐2 ☐3

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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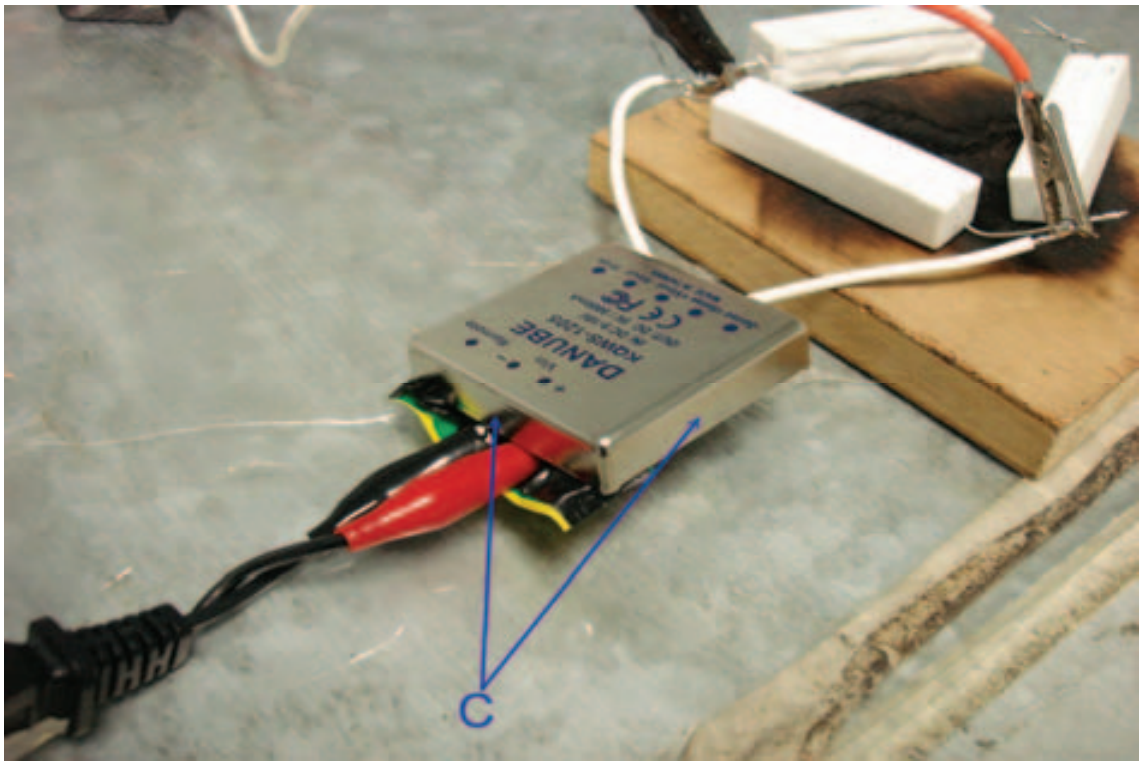
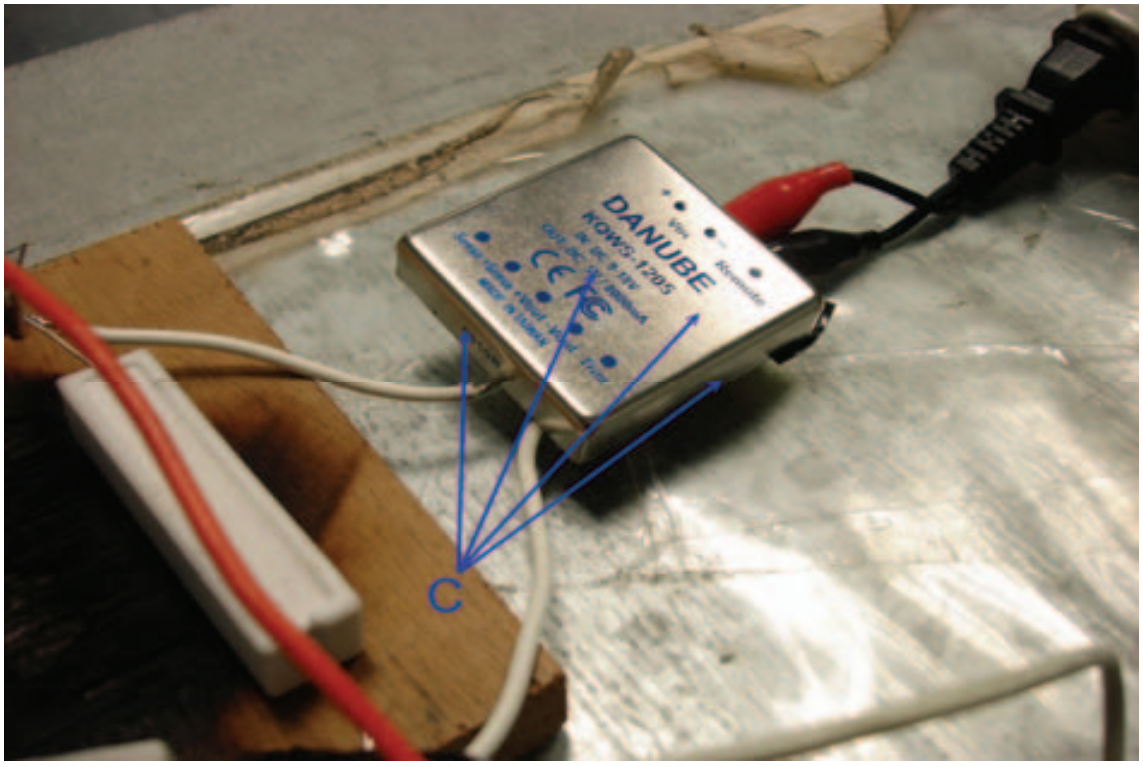
The Photo for Discharge Points of EUT





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8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz ~1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m

8.4.2. TEST INSTRUMENT

Radiated Electromagnetic Field Immunity Test Site (IEC/EN 61000-4-3)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	SYNNEX	BTO -LMIW300 - GB	A41202-0031	N.C.R.
LCD Monitor	Acer	AL1715sm	ETL13071994430236 6RH01	N.C.R.
Keyboard	SYNNEX	5211A	G4430091266	N.C.R.
Amplifier Freq. Range :80MHz ~ 1GHz	AR	150W1000M3	310037	N.C.R.
Amplifier Freq. Range :0.8MHz ~ 3GHz	AR	60S1G3M3	310102	N.C.R.
Digital SIGNAL GENERATOR	HP	ESG-D3000A	US36260655	DEC. 27, 2010
RF Power Meter	BOONTON	4232A-01-02	122202	DEC. 30, 2010
Log – Periodic Antenna	AR	AT5080	309817	N.C.R.
RF Communications test set	HP	8920A	3412A04298	DEC. 30, 2010
Test S/W	RS SW1005 R1_4			

NOTE: 1.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

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8.4.3. TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-3

a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

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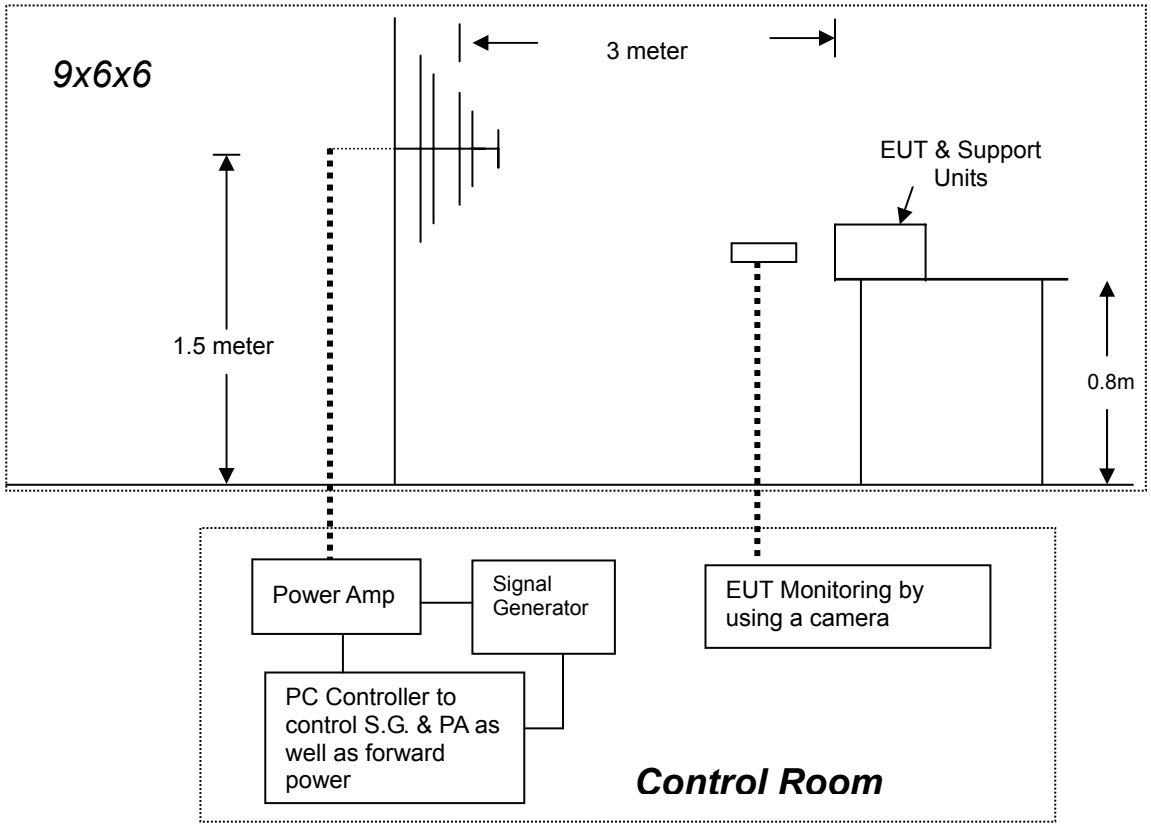
8.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 m in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 m in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

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8.4.5. TEST RESULTS

Temperature	26 °C	**Humidity**	42 % RH
Pressure	1022 mbar	**Tested By**	Agun Huang
Dwell Time		3 sec.	
Required Passing Performance		**Criterion A**	

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	0	3	Note☒1 ☐2 ☐3	A PASS
80 ~ 1000	V&H	90	3	Note☒1 ☐2 ☐3	A PASS
80 ~ 1000	V&H	180	3	Note☒1 ☐2 ☐3	A PASS
80 ~ 1000	V&H	270	3	Note☒1 ☐2 ☐3	A PASS

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line: 0.5 kV
Polarity:	Positive & Negative
Repetition Rate:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

8.5.2. TEST INSTRUMENT

Fast Transients/Burst Test Site (IEC/EN 61000-4-4)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572 P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	DEC. 28, 2010
Test S/W	CE Ware 3.00b			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

8.5.3. TEST PROCEDURE

a) Both positive and negative polarity discharges were applied.

b) The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 m.

c) The duration time of each test sequential was 1 minute.

d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

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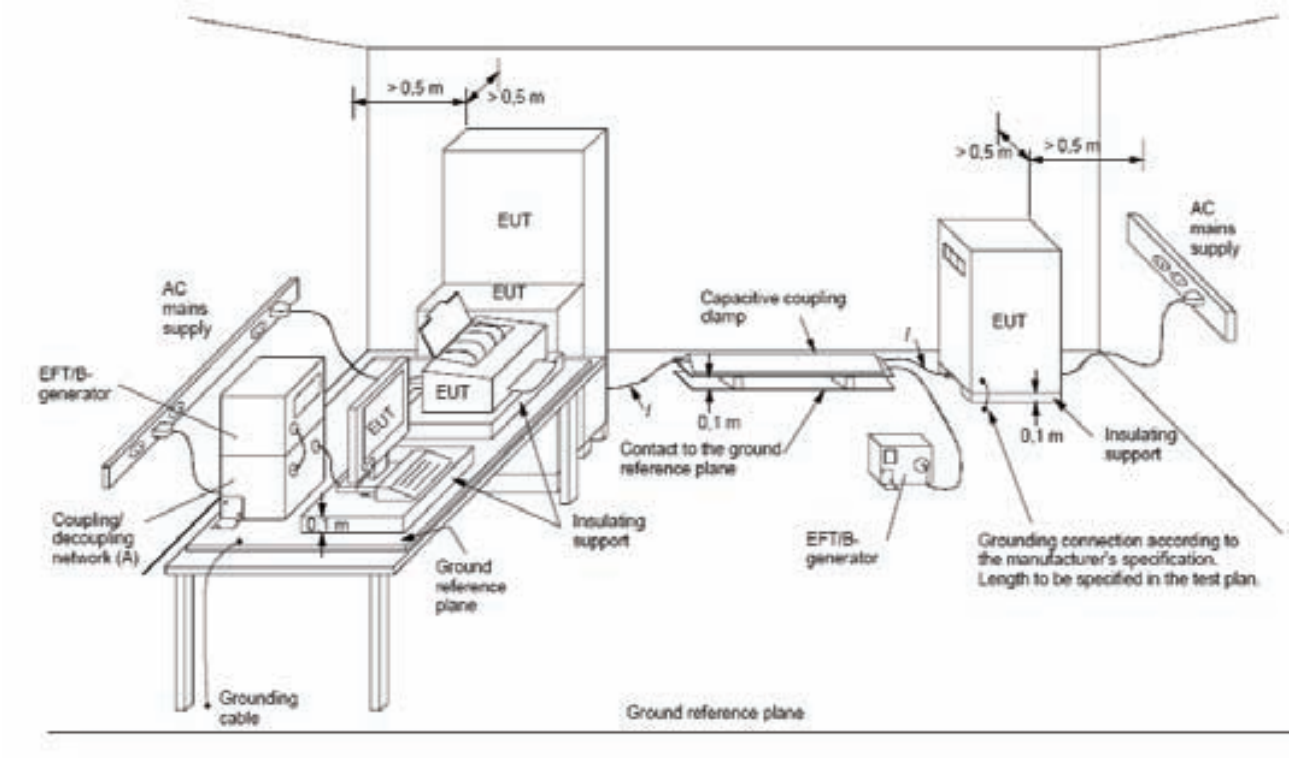
8.5.4.TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8 m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system. A minimum distance of 0.5 m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1 m thick. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system.

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8.5.5. TEST RESULTS

Temperature	24.6 °C	**Humidity**	47 % RH
Pressure	1023 mbar	**Tested By**	John Chen
Required Passing Performance		**Criterion B**	

POWER

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	0.5kV	☒A ☐ B ☐ C	Note☒1 ☐2 ☐3	A PASS
N	+/-	0.5kV	☒A ☐ B ☐ C	Note☒1 ☐2 ☐3	A PASS
L+ N	+/-	0.5kV	☒A ☐ B ☐ C	Note☒1 ☐2 ☐3	A PASS

SIGNAL

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
N/A					

Characteristics of the fast transient/burst generator

Burst duration	Burst Period	Repetition Rate	Rise time	Duration
15 ms $^{+}_{-}$20%	300 ms $^{+}_{-}$20%	5 kHz	5 ns $^{+}_{-}$30%	50 ns $^{+}_{-}$30%

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8/20 us Short Circuit Current
Test Voltage:	Power line ~ line to line: 0.5 kV
Surge Input/Output:	Telecommunication line: T-Ground / R-Ground
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 / 90 / 180 / 270
Pulse Repetition Rate:	2 times / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

8.6.2. TEST INSTRUMENT

Surge Immunity Test Site (IEC/EN EN 61000-4-5)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572 P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	DEC. 28, 2010
Test S/W	CE Ware 3.00b			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

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8.6.3. TEST PROCEDURE

a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 m in length.

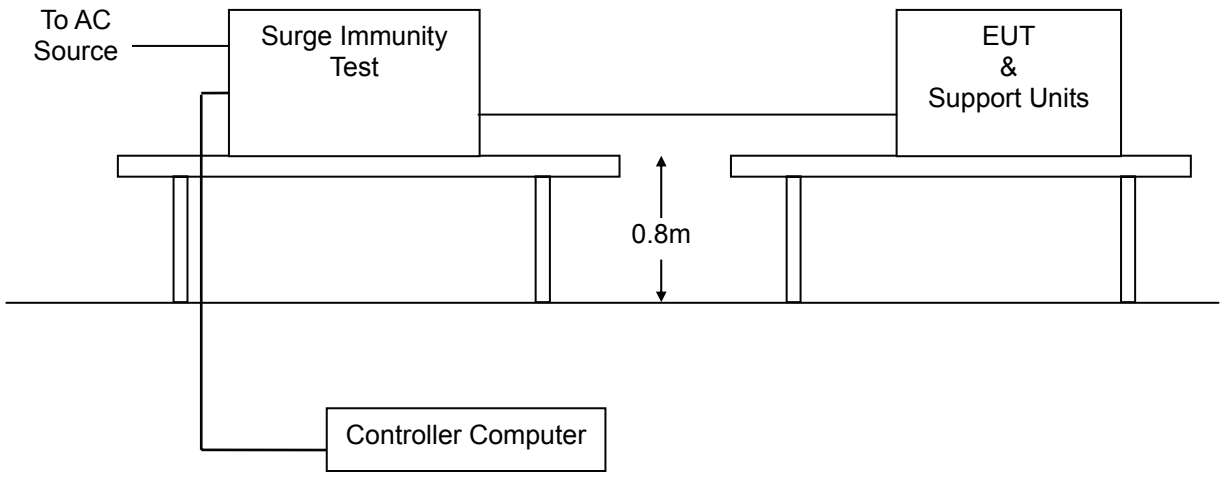
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 m in length.

8.6.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

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8.6.5. TEST RESULTS

Temperature	25 °C	**Humidity**	47 % RH
Pressure	1025 mbar	**Tested By**	John Chen
Required Passing Performance		**Criterion B**	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L – N	+/-	0.5kV	☒A ☐ B ☐ C	Note ☒1 ☐2 ☐3	A PASS

Repetition Rate	Waveform parameter	Coupling Rate
30 sec	Combine Wave 1.2μs/50μs 8μs /20μs	5 times
	Impedance 12 Ω / 2 Ω	Each Angle and Polarity

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 Vrms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Unshielded
Coupling device:	CDN-M2 (2 wires)

8.7.2. TEST INSTRUMENT

CS Test Site (IEC/EN 61000-4-6)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	HP	d330 uT	SGH3480LTH	N.C.R.
VGA Monitor	NEC	JC-1572VMA	6600645RA	N.C.R.
Keyboard	IBM	KB - 8923	1021424	N.C.R.
CS Frankonia EMVMess-System Gmbh	FRANKONIA	CIT-10/75	102C3220	SEP. 30, 2010
FCC Coupling Decoupling Network Freq. range : 150KHz~230MHz	FRANKONIA	CDN M2+M3	A3011095	JAN. 20, 2010
FCC EM Injection Clamp	----------	F-203I-23mm	449	DEC. 02, 2010
Test S/W	CS-EN61000-4-6			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

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8.7.3. TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50 ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

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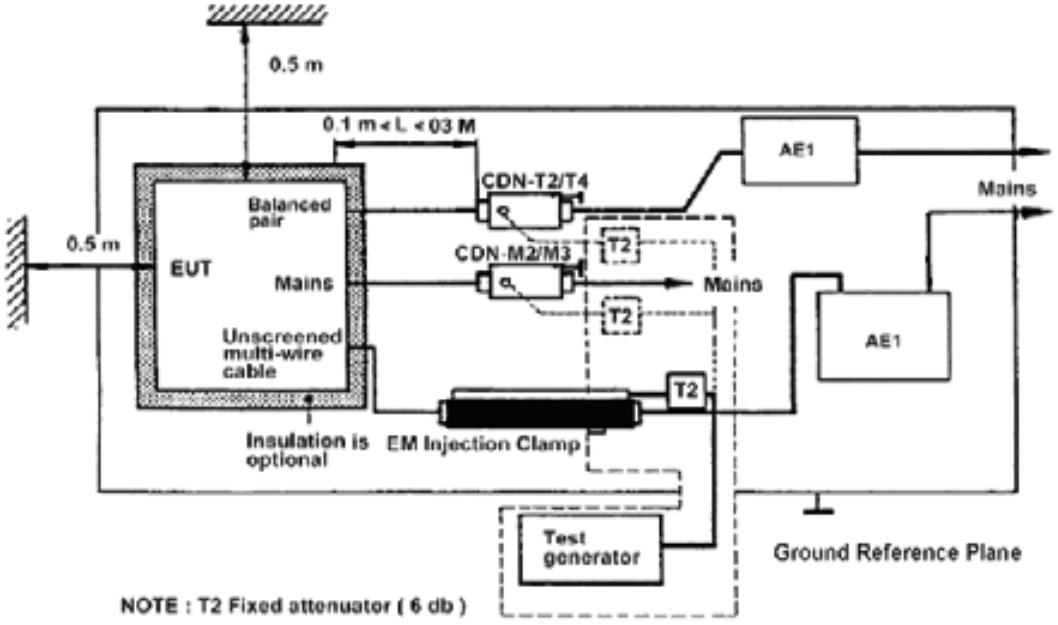
8.7.4. TEST SETUP



NOTE: 1. The EUT is setup 0.1m above Ground Reference Plane.
2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 m height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 m and 0.3 m from the projected geometry of the EUT on the ground reference plane.

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8.7.5. TEST RESULTS

Temperature	26 °C	**Humidity**	44% RH
Pressure	1032 mbar	**Tested By**	Hong Tsai
Required Passing Performance		**Criterion A**	

POWER

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Cord	CDN-☒**M2** ☐**M3**	☒**A** ☐ **B** ☐ **C**	**Note**☒**1** ☐**2** ☐**3**	A PASS

SIGNAL

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
N/A						

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-8
Frequency Range:	50/60Hz
Field Strength:	1 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

8.8.2. TEST INSTRUMENT

Power Frequency Magnetic Field Immunity Test (IEC/EN 61000-4-8)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Magnetic field generator	Schaffner	MFO 6501	154	JAN 21, 2011

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

8.8.3. TEST PROCEDURE

a) The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1 m thick insulating support.

b) The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

c) The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

d) The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

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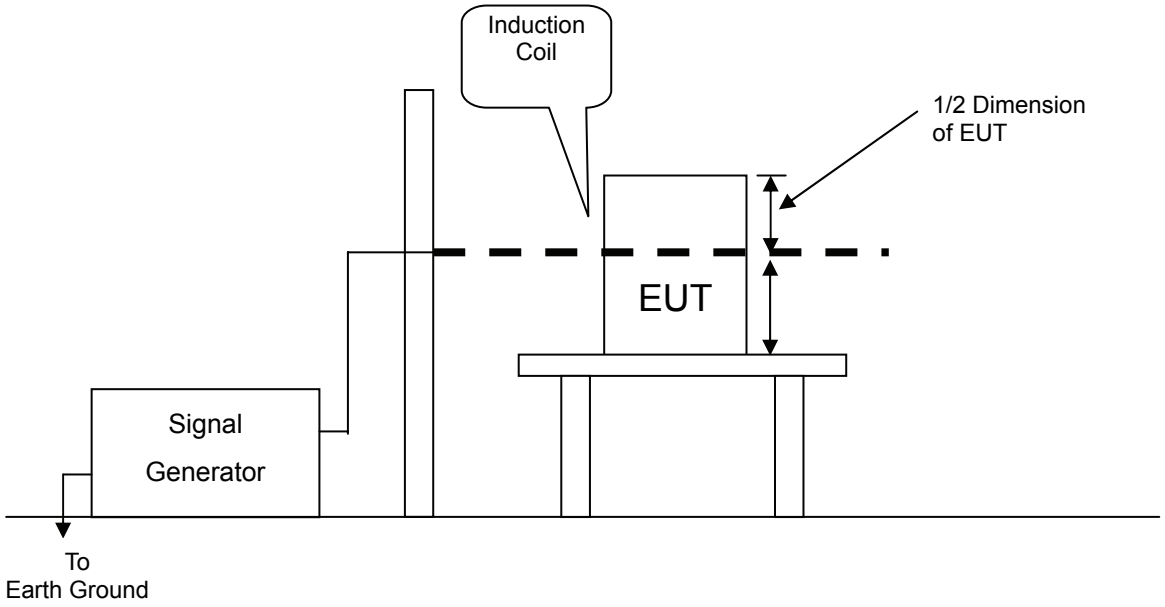
8.8.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

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8.8.5. TEST RESULTS

Temperature	26 °C	Humidity	42% RH
Pressure	1028 mbar	Tested By	Agun Huang
Required Passing Performance		Criterion A	

Power Frequency	50/60Hz			
Direction	**Field Strength A/m**	**Performance Criterion**	**Observation**	**Result**
X axis	1	☒A ☐B ☐C	Note☒1 ☐2 ☐3	A PASS
Y axis	1	☒A ☐B ☐C	Note☒1 ☐2 ☐3	A PASS
Z axis	1	☒A ☐B ☐C	Note☒1 ☐2 ☐3	A PASS

NOTE:
1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

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8.9. VOLTAGE DIP & VOLTAGE INTERRUPTIONS

8.9.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Phase Angle:	0 / 45 / 90 / 135 / 180 / 225 / 270 / 315 / 360
Test cycle:	3 times

8.9.2. TEST INSTRUMENT

Voltage Dips/Short Interruption and Voltage Variation Immunity Test Site (IEC/EN 61000-4-11)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	9171602305842005 72P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK 5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	EMCpro	0312231	DEC. 28, 2010
Test S/W	CE Ware 3.00b			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

8.9.3. TEST PROCEDURE

a) The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
b) Setting the parameter of tests and then perform the test software of test simulator.
c) Conditions changes to occur at 0 degree crossover point of the voltage waveform.
d) Recording the test result in test record form.

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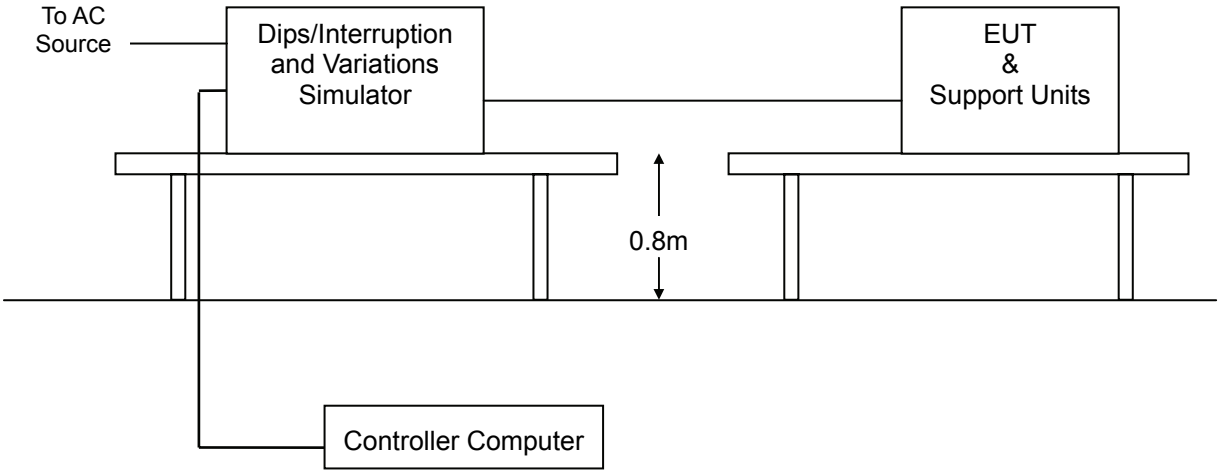
8.9.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.9.5.TEST RESULTS

Note: This EUT has not connection to AC Source directly. No applicability for this test.

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9 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST

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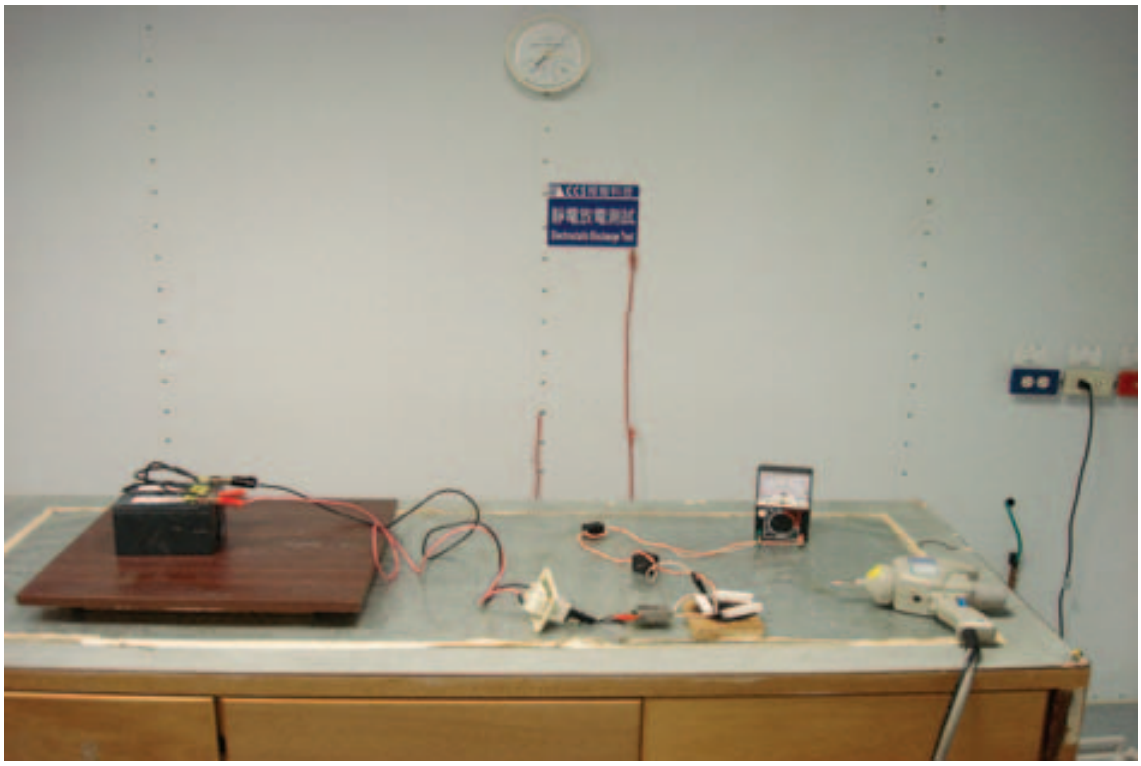
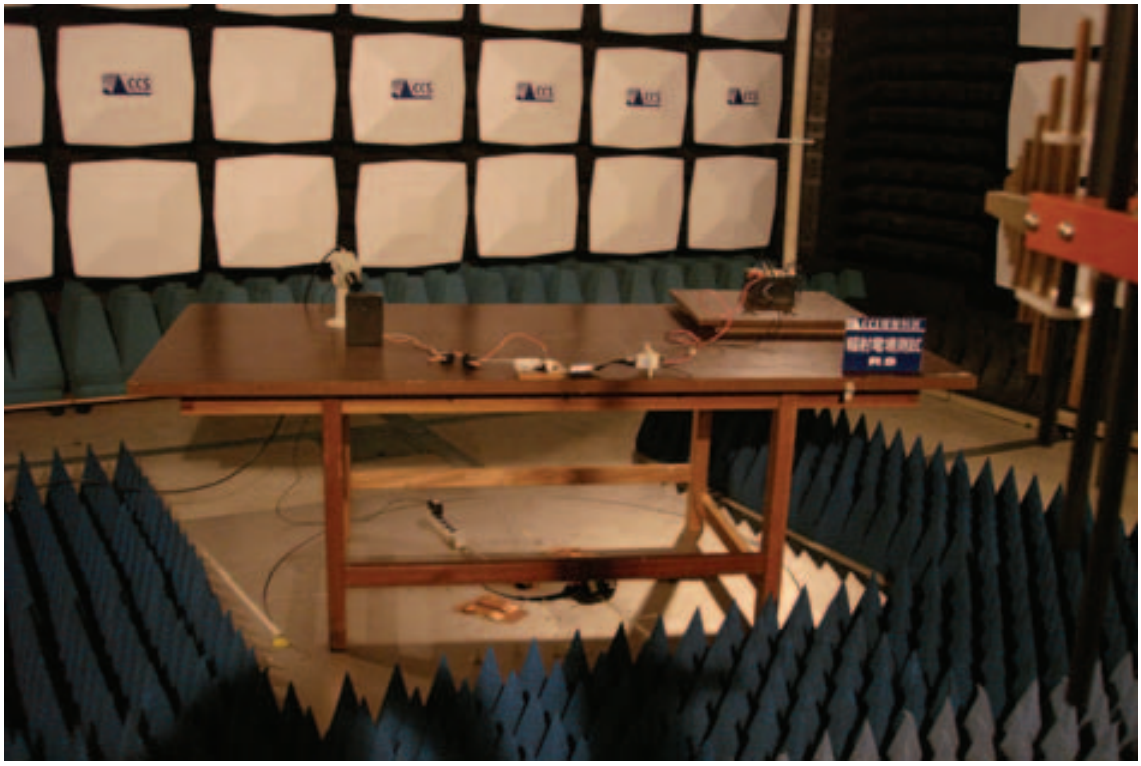
ESD TEST



RS TEST



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EFT TEST

SURGE TEST

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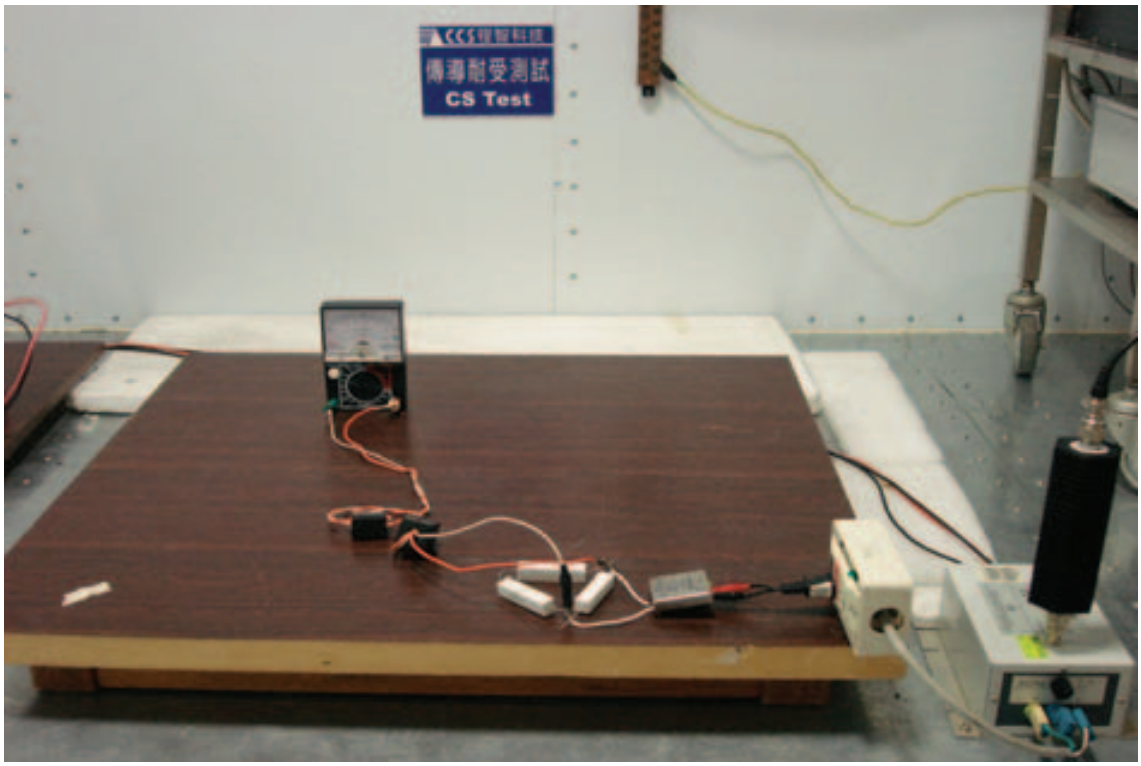
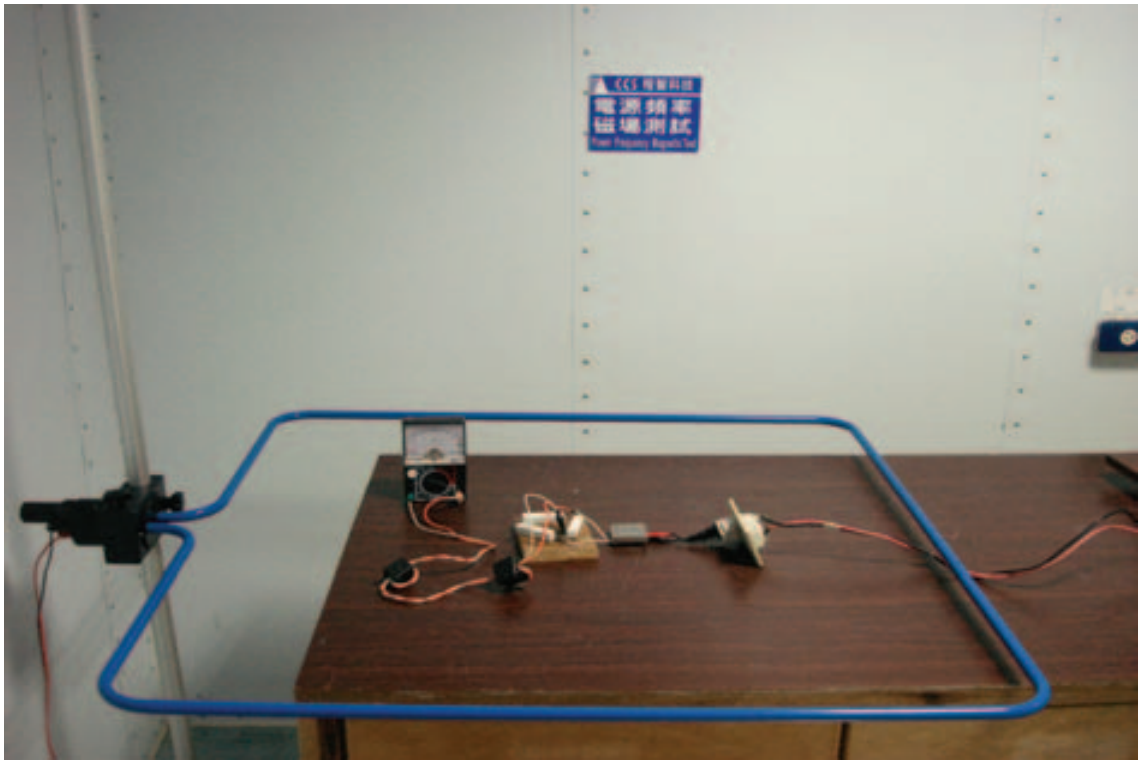
CS TEST



PFMF TEST



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